

requested. Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attachment is captioned "Version With Markings To Show Changes Made."

Rejection In View Of Priegnitz

Claims 15-23 have been rejected under section 103 as being unpatentable over U.S. Patent No. 6,162,267 to Priegnitz et al. U.S. Patent No. 6,162,267 was filed on Dec. 11, 1998.

The Attached to this Amendment is a 131 Declaration (actually there are two identical 131 Declarations, one is signed by Dr. Yong Wang and the other signed by Drs. Tonkovich and VanderWiel). As established by the facts set forth in the attached 131 Declaration, applicants possessed the claimed invention on or before the effective date of the cited reference (Priegnitz). Alternatively, the attached 131 Declaration shows as much of the claimed invention as is shown in the cited reference (Priegnitz) and therefore the Priegnitz reference is eliminated as prior art. See MPEP 715.02 citing *In re Stryker* 168 USPQ 372 (CCPA 1971) and *In re Wakefield*, 164 USPQ 636 (CCPA 1970). More specifically, the evidence in the 131 Declaration shows reduction to practice of: a steam reforming catalyst structure comprising a spinel support and a steam reforming catalyst (Rh or Ni). The catalyst structure was subsequently tested and found to possess the properties recited in claim 15 and described in the Example.

Thus, the 131 Declaration establishes that applicants possessed the claimed invention on or before Dec. 11, 1998 (or, alternatively, on or before Dec. 11, 1998, applicants possessed at least as much of the claimed invention as the Priegnitz reference). Accordingly, the Priegnitz reference has

been eliminated as prior art, and, withdrawal of the rejection in view of Priegnitz is respectfully requested.

Additionally, Priegnitz does not teach or suggest some of the claimed features (nor are they inherent). For example, Priegnitz does not teach or suggest a catalyst structure having a magnesia passivation layer as recited in claim 20, nor a catalyst made by impregnating with magnesia as recited in claim 19 (such as by impregnating an alumina support with a solution of magnesium nitrate). Thus, the claimed invention is additionally patentable based on this ground.

Conclusion

If the Examiner has any questions or would like to speak to Applicants' representative, the Examiner is encouraged to call Applicants' attorney at the number provided below.

Respectfully submitted,

Date: 11 Feb. 2003

send correspondence to:
Frank S. Rosenberg
18 Echo Hill Lane
Moraga, CA 94556
fax. no. (925) 376-8429

By: Frank S. Rosenberg

Frank S. Rosenberg
Registration No. 37,068
tel: (925) 376-8416

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

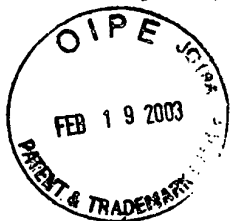
The paragraph beginning at page 1, line 9, after "RELATED APPLICATIONS", has been replaced with:

-- This is a divisional of U.S. Patent Application Ser. No. 09/375,615, now U.S. Patent No. [_____,] 6,284,217, filed August 17, 1999. --

IN THE CLAIMS

Claim 15 has been amended as follows:

15. (Amended) A steam reforming catalyst structure comprising:
- a support comprising a spinel support; and
- a steam reforming catalyst selected from the group consisting of rhodium, iridium, nickel, palladium, platinum, carbide of group [IVb] VIb and combinations thereof;
- wherein the catalyst structure has stability such that, when tested in a packed bed at 900°C, with a feedstream consisting essentially of methane and steam at a 1:1 ratio of methane to steam, at a constant pressure and a contact time such that there is a hydrocarbon conversion of at least 50%, and measuring the CO selectivity, wherein between 26 hours time-on-stream and about 40 hours time-on-stream, the CO selectivity remains essentially unchanged and the hydrocarbon absolute conversion changes less than about 5%.



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Wang et al.

Application No. 09/930,040

Filed: Aug. 14, 2001

For: METHOD AND CATALYST
STRUCTURE FOR STEAM
REFORMING OF A
HYDROCARBON

Art Unit: 1764

Examiner: B. Yildirim

Atty Docket: B-1482-DIV

RECEIVED
FEB 26 2004
TC 1700 MAIL ROOM

DECLARATION PURSUANT TO 37 CFR § 1.131

1. The attached document in which the first line reads "POx/SR" is a copy of a lab notebook page that was written on or before 11 December 1998. The entry "Yong: Ni or Rh (oxide) on MgO/Al₂O₃ (spinel)" is a note from a meeting showing that, on or before 11 December 1998, Yong Wang suggested preparing a steam reforming catalyst comprising Ni or Rh (oxide) on a MgO/Al₂O₃ spinel support.

2. The attached document in which the first line begins "Precoat of" is a copy of a lab notebook page that was written on or before 11 December 1998. This page shows that, on or before 11

December 1998, a $\text{MgO}/\text{Al}_2\text{O}_3$ spinel support was made by impregnating alumina with a magnesium nitrate solution.

3. The attached document in which the first line begins "Rhodium onto" is a copy of a lab notebook page that was written on or before 11 December 1998. This page shows that, on or before 11 December 1998, we prepared a rhodium oxide on $\text{MgO}/\text{Al}_2\text{O}_3$ spinel catalyst structure. The support referred to on this page is the $\text{MgO}/\text{Al}_2\text{O}_3$ spinel support described in paragraph 2 above.

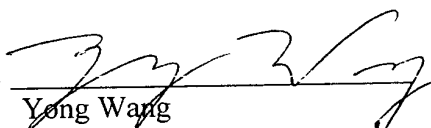
4. Subsequent testing of the catalyst described in paragraph 3 demonstrated the time-on-stream performance shown in Fig. 2 of the patent application.

5. The attached document in which the first line begins "NiO of" is a copy of a lab notebook page that was written on or before 11 December 1998. This page shows that, on or before 11 December 1998, we prepared a nickel oxide on $\text{MgO}/\text{Al}_2\text{O}_3$ spinel catalyst structure. The support referred to on this page is the $\text{MgO}/\text{Al}_2\text{O}_3$ spinel support described in paragraph 2 above.

6. All of the attached documents have been copied without change except that dates have been blanked out.

7. I declare that all of the above statements made of my own knowledge are true and all statements made on information and belief are believed to be true. I understand that willful false statements and the like are punishable by fine or imprisonment, or both (18 U.S.C. §1001), and may jeopardize the validity of the application or any patent issuing thereon.

Date: 2/15/2003

By: 
Yong Wang

Date: _____

By: _____
David P. VanderWiel

Date: _____

By: _____
Anna Lee Y. Tonkovich

POX/SR (CONT'D)

" O₂ CONV. ~ 100% → LIMITS CH₄ CONV.

" SIGNIFICANT H₂O FORMATION (H₂ SELECTIVITY??)

→ NEXT STEP: ALKALI PROMOTION

← compressor costs

→ LEE: POX MAYBE 'OFF THE TABLE' SOON → FOCUS ON SR

" CAN ADD MORE O₂ TO INCR. SELECTIVITY, BUT CONV. WILL DECR

→ CO₂ FAVORED AT HIGHER $\frac{O_2}{CH_4}$

→ YONG: Ni or Rh (oxide) on MgO/Al₂O₃ (spinel)

- SR: (mid-low Rh loadings done) Rh/α-Al₂O₃ - $\frac{3}{1} = \frac{H_2O}{CH_4}$ @ 25 ms

" ^{higher} loading performs better (2.8% Rh)

" both have very low conv. < 25% - Select. < 70%

" γ-Al₂O₃ RESULTS FROM EARLIER: PERF. MUCH BETTER (~100% CONV.) (Select.)

← @ 15 msec. to 25 msec. ↑ 7% Rh. (i)

WAYNE - CAT. PREP.

- 5% Co, Fe, Ru / γ-Al₂O₃ FOR MDS READY TOMORROW

- NEED SUPPORTS - YONG: Strem, Aldrich? — ~~OK? Aldrich is from Strem?~~

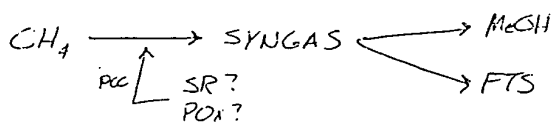
← ERIC

- ERIC: FOAMS FOR YUFEI ARE READY - CERAMIC ADHESION TECHNIQUES

→ SINGLE POX/SR REACTIONS: ADAPT. TO USE SAME 1/2" ANNULAR TUB

- check sizing / flow options

CAT. SELECTION



- SR

" literature: precious metals - Rh best

supports - all - Al₂O₃ & ZrO₂ & MgO best

promoters - alkali oxides

- MeOH

" thermo: low T, high P

" system: low P, high cat. activity (even lower T)

" commercial: Cu-Zn/Al₂O₃ (ICI - Catalco)

- @ 120 msec.: 2.5g MeOH/g cat. hr (~100% selectivity) } 30 ATAN

" literature: Rh, Pd - ~~selective~~ but not as activity

Project No. _____ Date of Work _____

Entered By DW Date _____

Disclosed To and Understood By _____

Signed 1. D. J. [Signature] Date _____

M. R. [Signature]

Date _____

93-6 γ - Al_2O_3
 Precoat of ~~stream~~ α - Al_2O_3 with MgO at 6% wt
 from July 24, 1997 Paper by Choudhary, Uphade, Mammann
 from paper: Mg % reported as % MgO .

99-007

<u>Crucible</u> <u>WT.</u>	<u>wt</u> <u>Al_2O_3</u>	<u>γ-Al_2O_3 wt</u>	<u>Out of Oven @ 900°C</u>
49.1663	51.1702g	2.0039g	51.2980

$$\text{MgO} \Delta = 0.1278\text{g}$$

$$(94) \text{ total wt} = 2.0039\text{g}$$

$$\text{total wt} = 2.1318\text{g}$$

want 0.1279g of MgO using $\text{Mg}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$

$$\frac{\text{MgO}}{\text{Mg}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}} = \frac{40.3}{256.4} = \frac{0.1279\text{g}}{\text{Mg Nitrate}} \Rightarrow 0.8137\text{g}$$

Must not contain
 with any O_2 from
 Alumina

For incip. wettness: $2.00\text{g} \times \frac{2.3\text{ml}}{3} \Rightarrow 4.6\text{ml sol'n}$

→ Used 0.8158g Mg Nitrate and 4.63ml water added
 (easily went into solution)

Into oven and used same temp program to:

Seg 5	Seg 6
Ramp to 900°	Dwell
at 3.0°/min	120 min

6.0% MgO Loading
 1.88g of -70 +100 mesh pre coated support
 ($\approx 0.25\text{g} < 100\text{mesh}$)

Check for incipient wettness with water using -100 me
 $\sim 0.52\text{ml/g} \cdot 2.36\text{g of support} \Rightarrow 2.20\text{ml/g}$

Rhodium onto MgO Precoated $\gamma-Al_2O_3$ 11
 13% as RhO_2 (for Methane to Syn Gas)

Precoated Support from pg 7

13699-011

Dish Wt. cat. Support

37.0331g 37.6992g \Rightarrow 0.6661 g of 6% MgO pre coated Support

(87) total wt = 0.6661 g
 total wt = 0.7656g \Rightarrow 0.0995 g RhO_2

$$\frac{Rh}{RhO_2} = \frac{Rh}{RhO_2} = \frac{x}{.0995} = \frac{102.9}{134.9} \Rightarrow .0759 \text{ g Rh needed}$$

Using Engelhardt's 10.37 % Rh solution:

10.37% sol'n = .0759 g Rh

sol'n = .7321g

0.7376 g sol'n + Water = 1.3755

Calcined at 500° for 180 min (pg 9 program)

Out of oven: 37.8060 \Rightarrow 0.1068g RhO_2 with 0.7729g Total

0.1068g / .7729g RhO_2 Catalyst

13.82 % RhO_2

Project No. _____ Date of Work _____

Entered By A. Mox _____ Date _____

Disclosed To and Understood By _____

Signed 1. D. C. Mox _____ Date _____

2. [Signature] _____ Date _____

NiO of 13% onto MgO Precoated γ -Al₂O₃
(Methane to Syn Gas)

Using support made on previous page:

13699-008

<u>Dish</u> <u>wt</u>	<u>Dish &</u> <u>Cat. Support</u>	
37.7403	38.3980	0.6577g of precoated support

(87.0%) total wt = 0.6577g
total wt = 0.7560g \Rightarrow 0.0983g NiO wanted

$\frac{\text{NiO}}{\text{Ni(NO}_3)_2 \cdot 6\text{H}_2\text{O}} = \frac{74.71}{290.81} = \frac{0.0983}{\text{Ni(NO}_3)_2 \cdot 6\text{H}_2\text{O}} \Rightarrow 0.3826 \text{ g Ni(NO}_3)_2 \cdot 6\text{H}_2\text{O needed}$

$2.20 \frac{\text{ml}}{\text{g}} \times 0.6577\text{g} = 1.45 \text{ ml}$

Used \Rightarrow 0.3862 g in 1.44 ml H₂O

Thurs. Out of oven, 500°: 38.4889g \Rightarrow .0909g NiO

$\frac{.0909 \text{ NiO}}{0.7486 \text{ g total}} = 12.14\% \text{ NiO}$

— Paper lists %'s in oxides

Project No. _____ Date of Work _____
Entered By W. Wilcox Date _____
Disclosed To and Understood By _____
Signed 1. [Signature] Date _____
2. [Signature] Date _____



FEB 19 2003 10:04

VELOCITY, INC.

6147333301 P.01

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Wang et al.

Application No. 09/930,040

Filed: Aug. 14, 2001

For: METHOD AND CATALYST
STRUCTURE FOR STEAM
REFORMING OF A
HYDROCARBON

Art Unit: 1764

Examiner: B. Yildirim

Atty Docket: B-1482-DIV

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Date: _____

By: _____
Yong Wang

Date: Feb. 11, 2003

By: 
David P. VanderWiel

Date: Feb 10, 2003

By: 
Anna Lee Y. Tonkovich

POX/SR (CONT'D)

O₂ CONV. ~100% → LIMITS C₂H₄ CONV.

SIGNIFICANT H₂O FORMATION (H₂ SELECTIVITY ??)

→ NEXT STEP: ALKALI PROMOTION

→ LEE: POX MAYBE OFF THE TABLE SOON → FOCUS ON SR AS

"CAN ADD MORE O₂ TO INCR. SELECTIVITY, BUT CONV. WILL DECR

→ CO₂ FAVORED AT HIGHER $\frac{O_2}{C_2H_4}$

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- SR: (mid-low Rh loadings done) Rh/α-Al₂O₃ - $\frac{3}{1} = \frac{11.6}{2.6}$ @ 25 m

" ^{higher} loading performs better (2.8% Rh).

" both have very low conv. < 25% - Select. < 70%

" γ-Al₂O₃ RESULTS FROM EARLIER: PERF. MUCH BETTER (~100% CONV.) (Select. ~ 70% Rh (H₂ @ 15 m, 25 m) → 7% Rh (H₂ @ 15 m, 25 m)

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- NEED SUPPORTS - YOUNG: SHEN, ALKALI? --- ~~OKO DADAS FROM SHEN~~

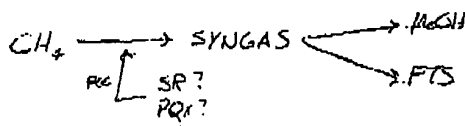
- ERIC

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→ SINGLE POX/SR REACTORS: ADAPT. TO USE SAME 1/2" ANNULAR TUB

- check sizing / flow options

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- SR

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supports - all --- Al₂O₃ & ZnO & MgO best

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" literature: Rh, Pd - selective but not as activity

Project No. _____ Date of Work _____
Entered By DUV _____ Date _____
Discovered To and Understood By _____
Signed T. _____ Date _____

1393-b Al_2O_3
Precoat of ~~Stream A~~ Al_2O_3 with MgO at 6% wt 7
from July 24, 1997 Paper by Choudhary, Upadhyay, Alammam
from paper: Mg % reported as % MgO

99-007 Crucible w/p- Al_2O_3 Al_2O_3 at Out of Oven @ 900°C
49.1663 51.1702g 2.0039g 51.2980

$\text{MgO} \Delta = 0.1278\text{g}$

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Must not combine with any O_2 from Air

For incip. wettness: $2.00\text{g} \times 2.3\text{ml} \Rightarrow 4.6\text{ml soln}$

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(easily went into solution)

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6.0% MgO Loading.
1.88g of ~70 +100 mesh pre-coated support
($\approx 0.05\text{g}$ <100 mesh)

Check for incipient wettness with water using ~100 mesh

~0.52g for .236g of support $\Rightarrow (2.20\text{ ml/g})$

Rhodium onto MgO Precoated $\gamma-Al_2O_3$ ¹¹
 15% as Rh_2O_3 (For Methane to Syn Gas)

Precoated Support from pg 7

13699-011

Dish wt. ^g ~~cal. Support~~

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0.7376 g soln + water = 1.3755

Calced at 500° for 180 min (pg 7 prep work)

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0.1068g / .7729g Rh_2O_3 Calc'd

13.82% Rh_2O_3

Project No. _____ Date of Work _____
 Entered By: D. Abney Date _____
 Disclosed To and Understood By _____
 Signed 1: D. Abney Date _____
 2: _____

Feb 10 22 10:17a

frank rosenberg

925-3-8429

p.5

02/10/03 10:51 FAX 5093765108

ENSL IFS

0002

8

NiO of 13% onto MgO Precoated $\gamma\text{-Al}_2\text{O}_3$
(Methan to Syn Gas)

Using support made on previous page:

13699-008

Dish
wt

37.7403

Dish &
wt support

38.3980

0.6577g of precoated support

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Paper lists %'s in oxides

Project No.

Date of Work

Entered By

Date

Discussed To and Understood By

Signed 1

Unit

2

Date